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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/692,007	10/19/2000	Stephen P. DeOrnellas	TEGL1082US1 SRM	7175

23910 7590 01/29/2002

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EXAMINER

UMEZ ERONINI, LYNETTE T

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 01/29/2002

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/692,007	Applicant(s) DEORNELLAS ET AL.	
	Examiner Lynette T. Umez-Eronini	Art Unit 1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on _____.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-41 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-41 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
 If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) ☐ All b) ☐ Some * c) ☐ None of:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
 * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
 a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

This action is in response to a communication filed November 9, 2001. The last office action of 8/13/2001 is withdrawn and is replaced by the following office action.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 1 and 13 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Applicant has failed to describe in the Specification and to show in the Drawings a second pattern being etched in a layer corresponding to the first pattern.

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

In claims 13; 22; 25; 26, 28; 29; 30; and 34, lines 1 and 2, "minimizing growth of the width of features" is indefinite for failing to limit the scope of the process and to specify the extent to which the critical dimension growth of width features is minimized.

In claims 25; 28; 29; 30; and 34, line 1, "features" is indefinite because its meaning is unclear.

Claim Rejections - 35 USC § 102/103

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1, 2, 4-7, 9, and 35-41; 13-15, and 18; and 25-33 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Yoo (US 5,670,423).

Yoo teaches a method of controlling the critical dimension width of polysilicon (column 1, lines 10-15). The method comprises sputtering a titanium or titanium nitride (reactive metal) hard semiconductor mask **34B** directly overlying a polysilicon or polycide layer **16** and overlying a semiconductor substrate **10** (column 1, lines 29-37 and Figure **5A**); etching the hard mask layer **34** and polysilicon layer **16** that are not covered by the photoresist mask **36**, wherein the titanium hard mask **34** is wet or plasma etched (column 1, lines 50-55). Plasma etching the hard mask that lie over a semiconductor substrate suggests etching is carried out in a chamber, which reads on processing the work piece in a reactor using an etch step.

Using the same steps of Yoo as those of the claimed invention would inherently result in a method for minimizing critical dimension growth of the width features located on a work piece.

Claim Rejections - 35 USC § 103

7. Claims 3, 8, 10-12, 16, 17, 19, 20-24, and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoo ('423) as applied to Claims 1, 13, and 30 above and further in view of Fullowan et al. (US 5,176,792).

Yoo differs in failing to teach providing energy to the reactor in order to increase a rate of oxidation of the hard mask in order to slow down the rate of erosion of the hard mask, **in claims 10, 22 and 34**; providing energy causes the substrate in the reactor to be heated to a temperature in the range of from about 80°C to about 300°C, **in claim 11 and 23**; and oxidizing the hard mask either prior to or during the processing step, **in claims 12 and 24**.

Fullowan teaches plasma etching a titanium mask with a fluorine-containing plasma such as CF₄ or SF₆ and each step in the process can be effected without subjecting the workpiece to temperatures outside the range between room temperature and 200°C. Since Fullowan etches a titanium mask with a fluorine plasma and within the same temperature range as that of the present invention and Specification (page 9, lines 8-13 and page 10, lines 22-27), then using Fullowan's etching method would inherently provide energy to the reactor in order to increase a rate of oxidation of the hard mask in order to slow down the rate of erosion of the hard mask, **in the instant**

claims 10, 22 and 34; provide energy that causes the substrate in the reactor to be heated to a temperature in the range of from about 80° to about 300°C, **in the instant claim 11 and 23**; and oxidizes the hard mask either prior to or during the processing step, **in the instant claim 12 and 24**.

Hence, it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Yoo by using the method of providing energy to the workpiece as taught by Fullowan for the purpose of inhibiting undercutting of the mask.

Yoo differs in failing to teach exposing the hard mask to a stream of oxidizing gas **in claims 3, 8, 16, 17, 20, and 32**.

It is well known in the art to etch Ti and TiN with a carbon and fluorine gas, such as CF₄, which is an oxidant.

It would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Yoo by using a conventional plasma such as fluorine to etch as well as oxidize the hard mask for the purpose of obtaining the best etched product.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Saxena et al. (US 4,057,460) is relied upon to teach plasma-etching titanium with a fluorine species consisting of CF₄ (column 1, line 68 – column 2, line 3).


Art Unit: 1765

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lynette T. Umez-Eronini whose telephone number is 703-306-9074. The examiner can normally be reached on First Friday.

ltue
January 27, 2002


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